NCEP CFS V2.0 Coupled Model Developmental Activities in India

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with inputs from
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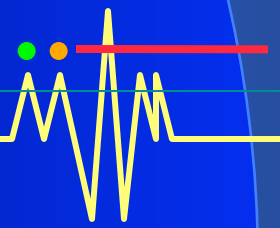
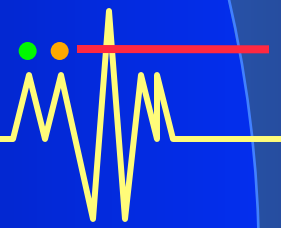
Outline

- Background
- What in CFS needs to be improved?
- How do we want to address them?
- Future plans
  - Seasonal Prediction
  - Extended Range Prediction
  - Climate Change
  - Short range prediction



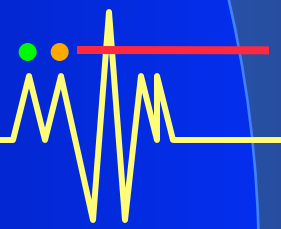
NCEP-MoES Collaboration

- An Implementation Agreement between NCEP-MoES on improving monsoon prediction
- Agreement involves transferring NCEP modeling infrastructure (GFS/GSI; CFS.v2; GODAS) to participating agencies within the MoES
- In April 2011, scientists from NCEP installed the latest prediction system on the HPCs within the MoES, and
- Held a training workshop in Pune, India, on various aspects of GSI, GFS, CFS.v2



NCEP-MoES Collboration

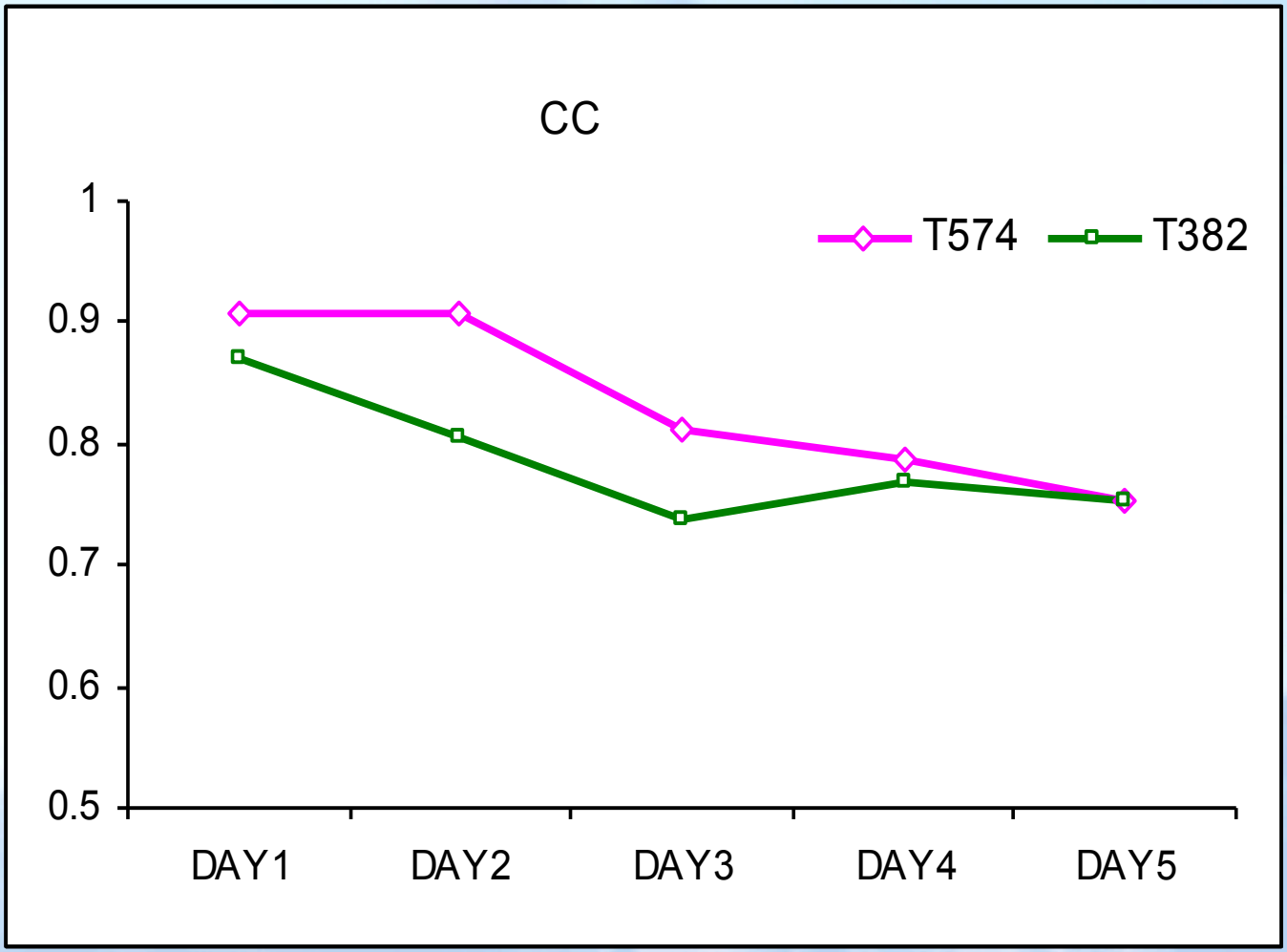
- Modeling Systems running in India
  - GFS (T574/L64) & GSI : NCMRWF & IMD
  - CVS.v2 : IITM
  - GODAS : INCOIS
  - HWRF : IMD



Results from the GFS

- **GFS T382 is made operational at IMD New Delhi since May 2010. The model is run twice in a day with complete data assimilation system**
- **GFS T574 is being run in experimental model since 1 June 2011**
- **Products are available in the IMD web site: www.imd.gov.in**
- ***The input-results are based on data from 1 June to 11 July 2011***

T382 vs. T574



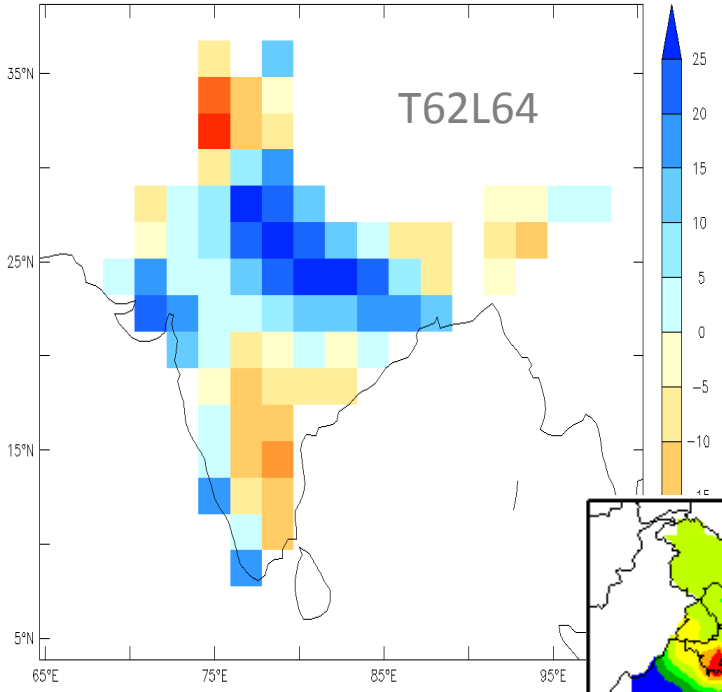
Compared to GFS T382, GFS T574 has better skill (correlation) in all day1-day4 forecast, indicating the better predictability of daily mean rainfall over India

Dynamical Seasonal Prediction of Indian Monsoon

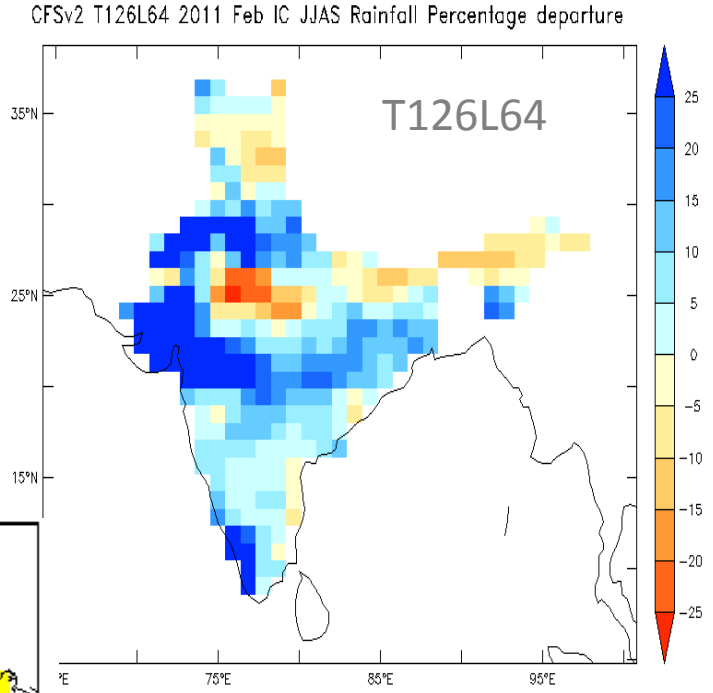
With Initial Conditions generated within India at (INCOIS & NCMRWF)

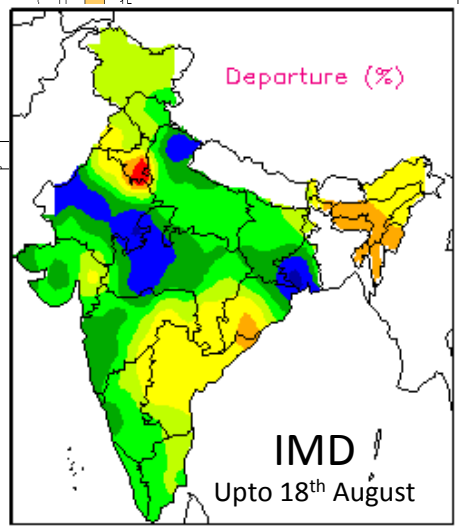
Rainfall – 2011

IITM CFS T62



IITM CFS V2.0 T126

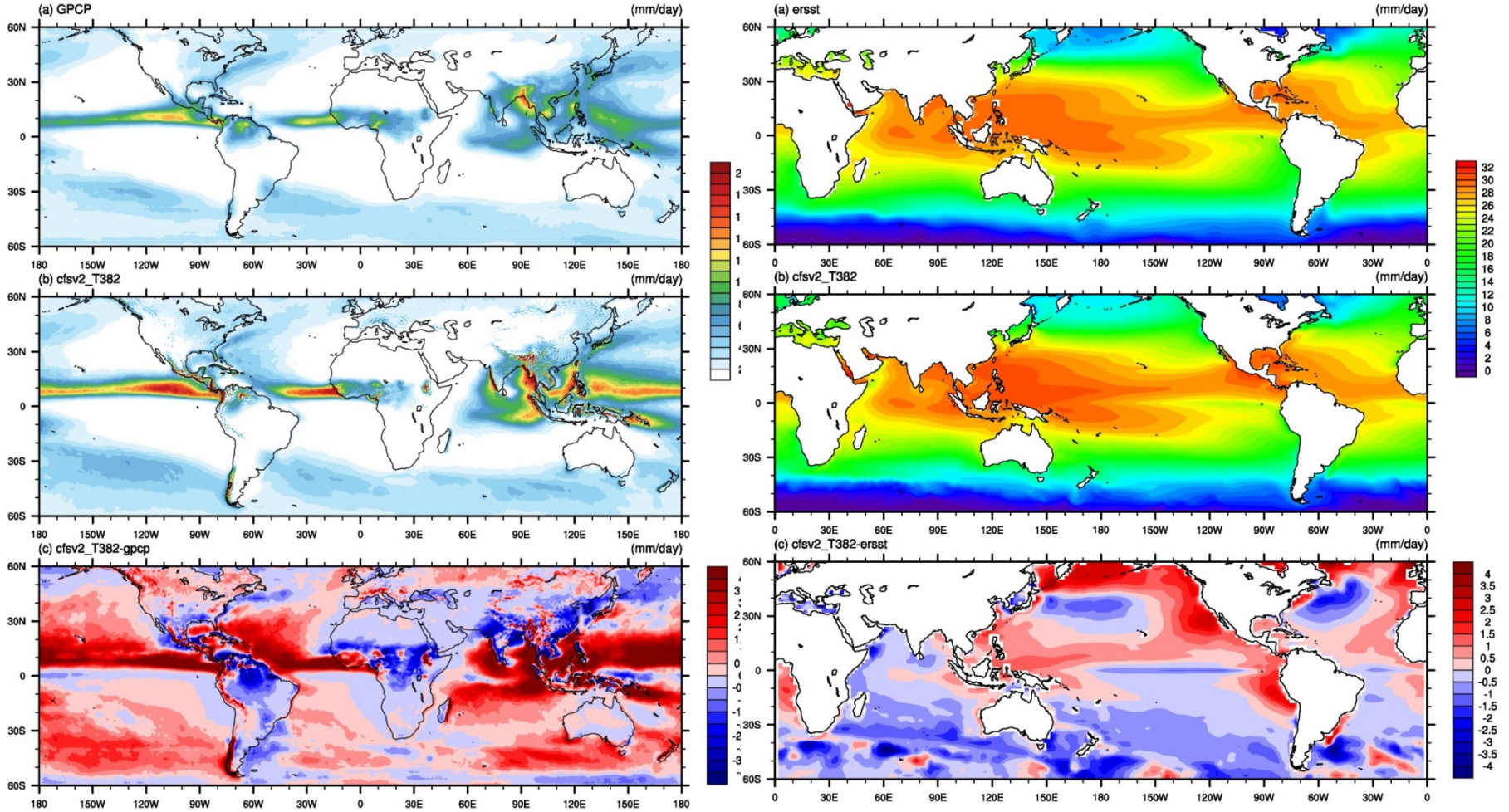




Central Indian above normal rain predicted by CFS model

Below normal rainfall over southern peninsular India

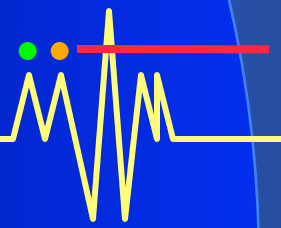
Rainfall/SST JJAS mean (with Feb. IC)



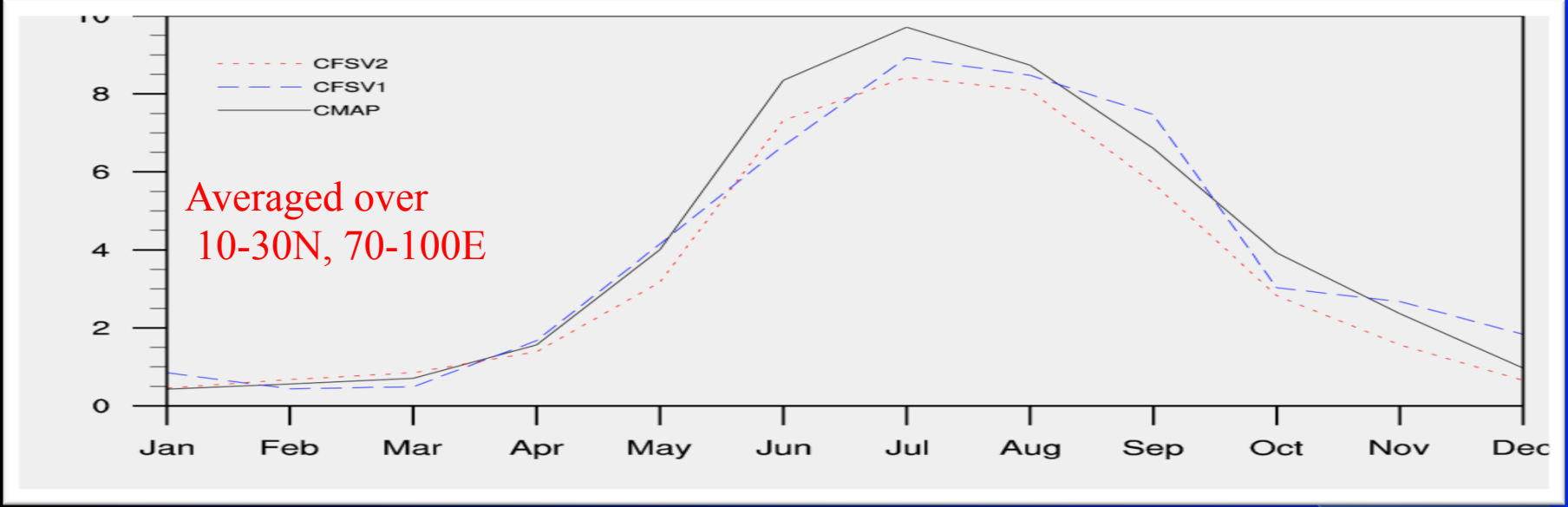
CFS.v2: What needs to be Improved?

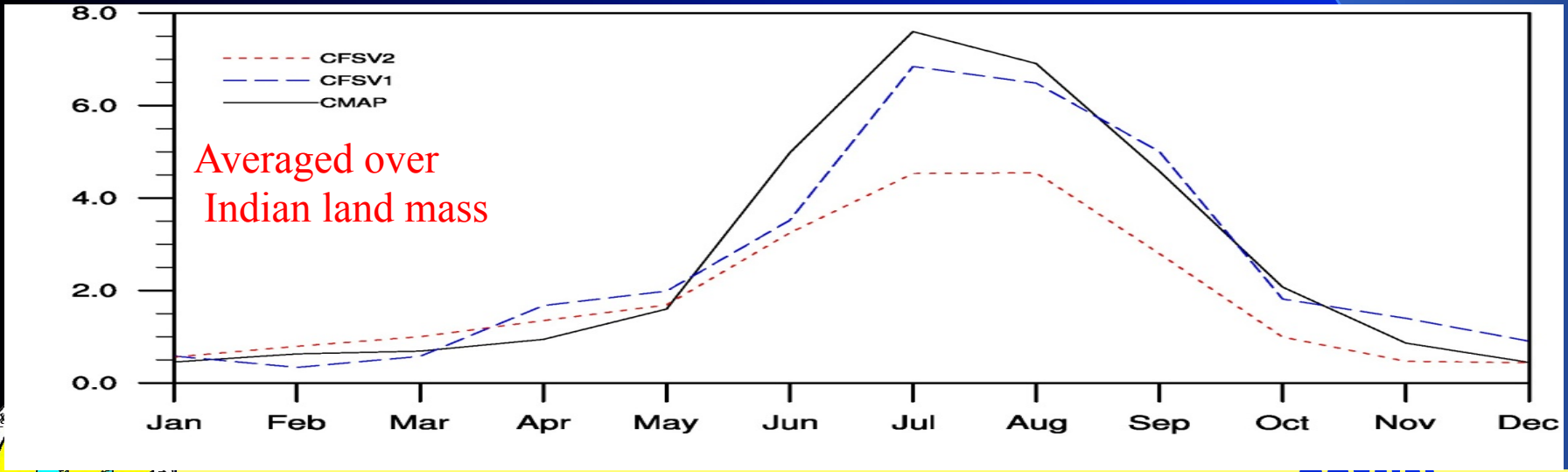
CFS V2 Analysis

Last 20 years of free run



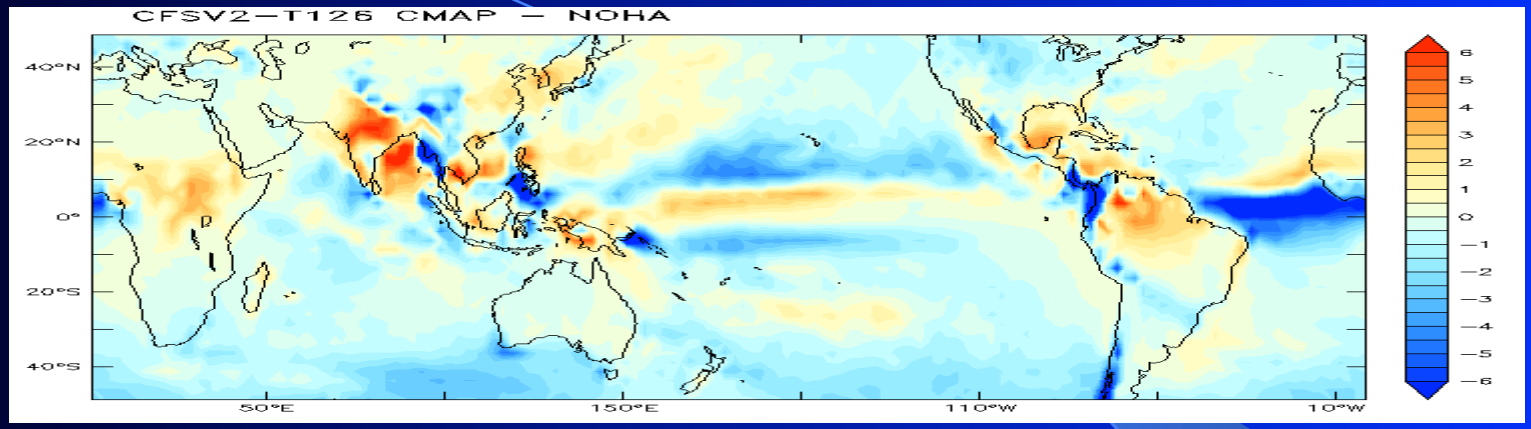
Rainfall Seasonal cycle



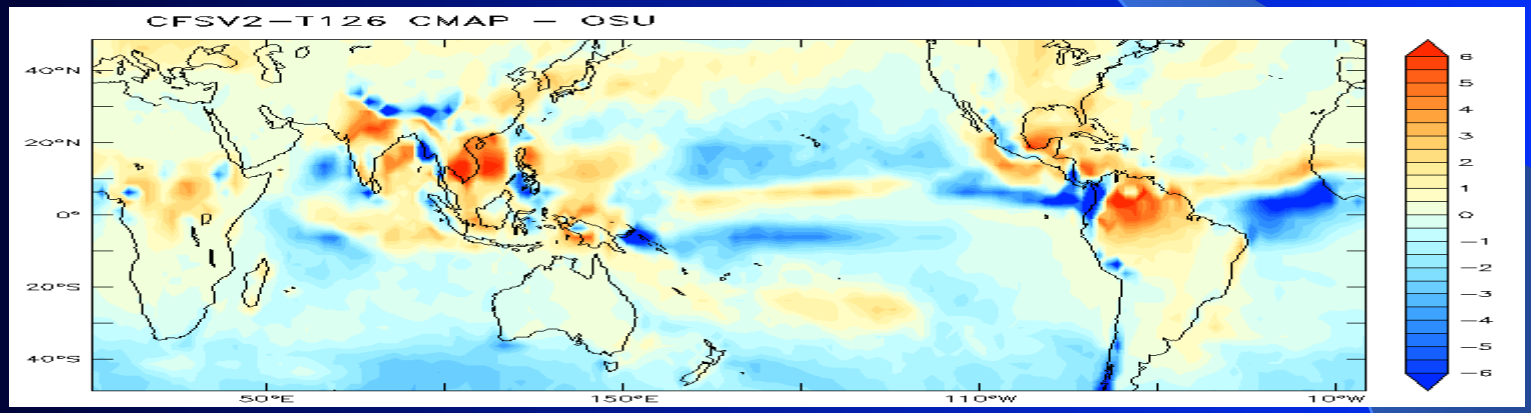


Rainfall Difference (JJAS)

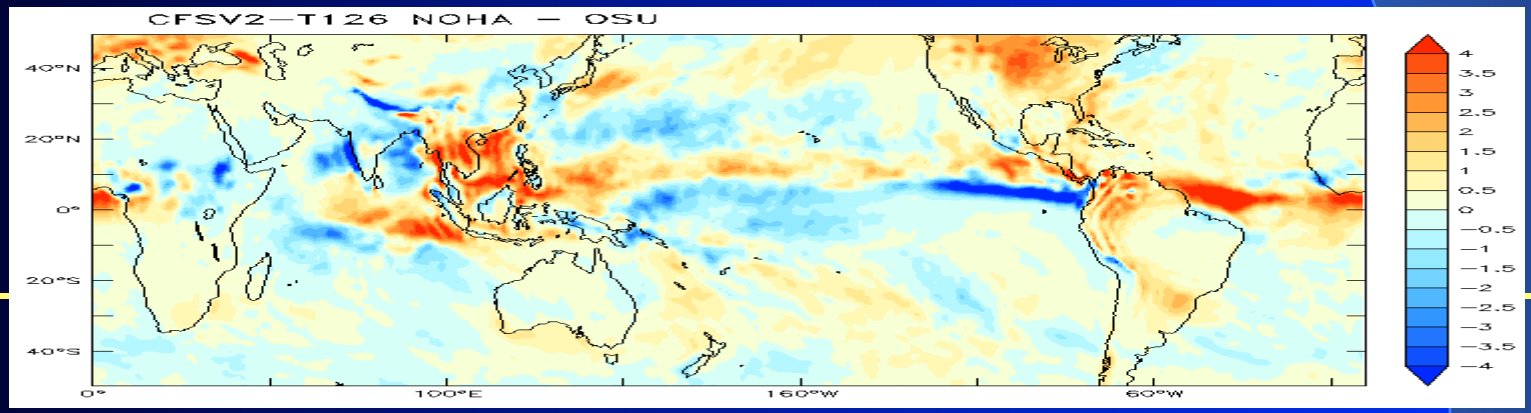
CMAP - Noah



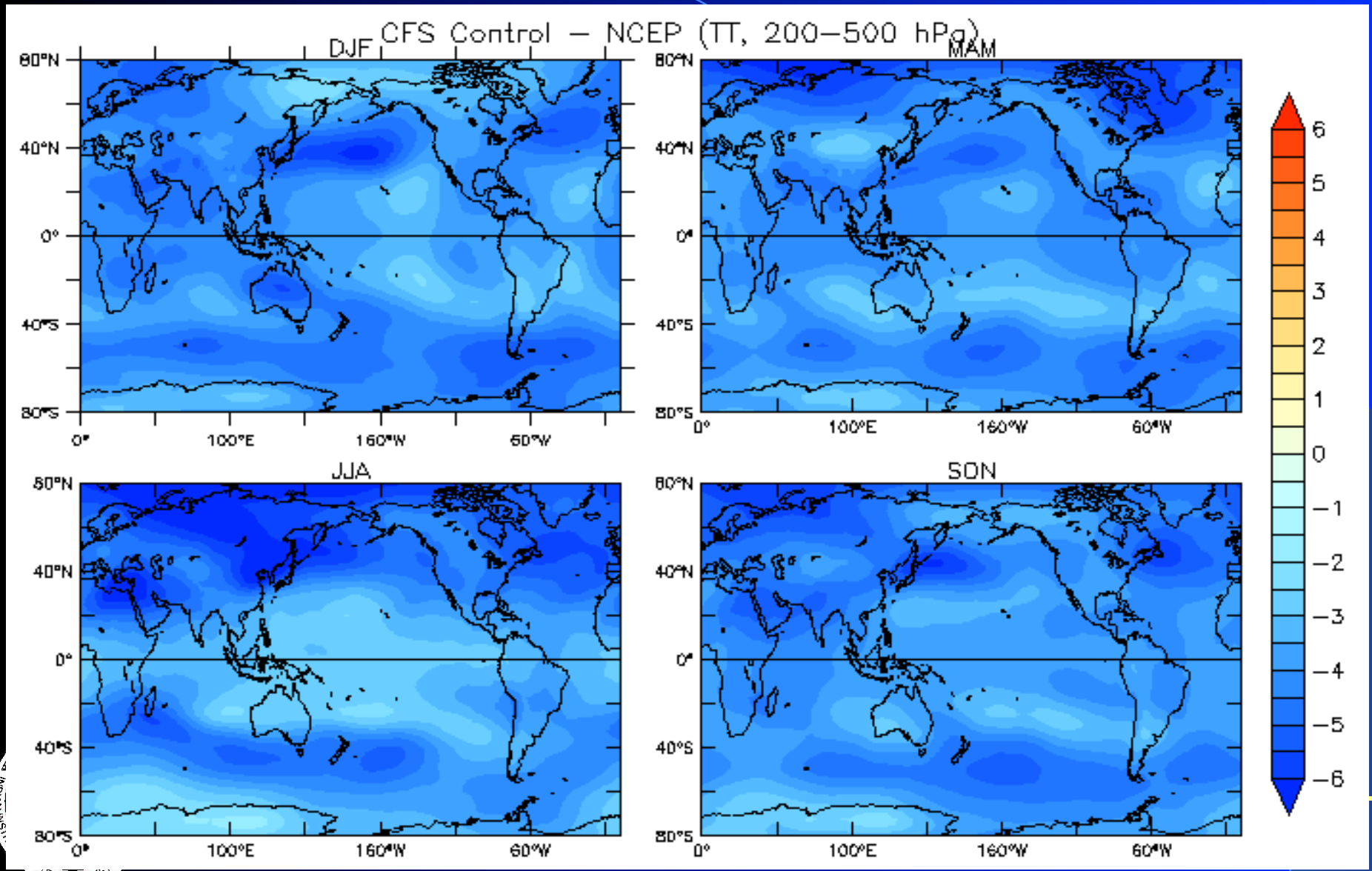
CMAP - OSU



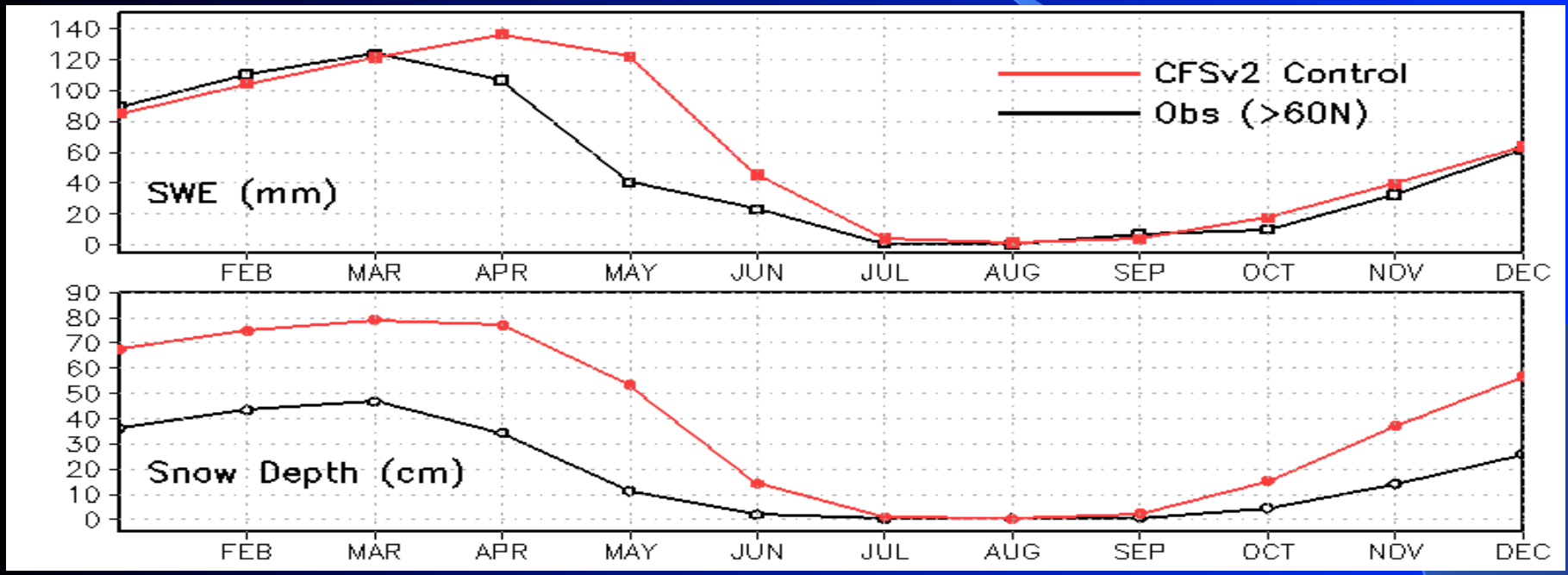
Noah - OSU



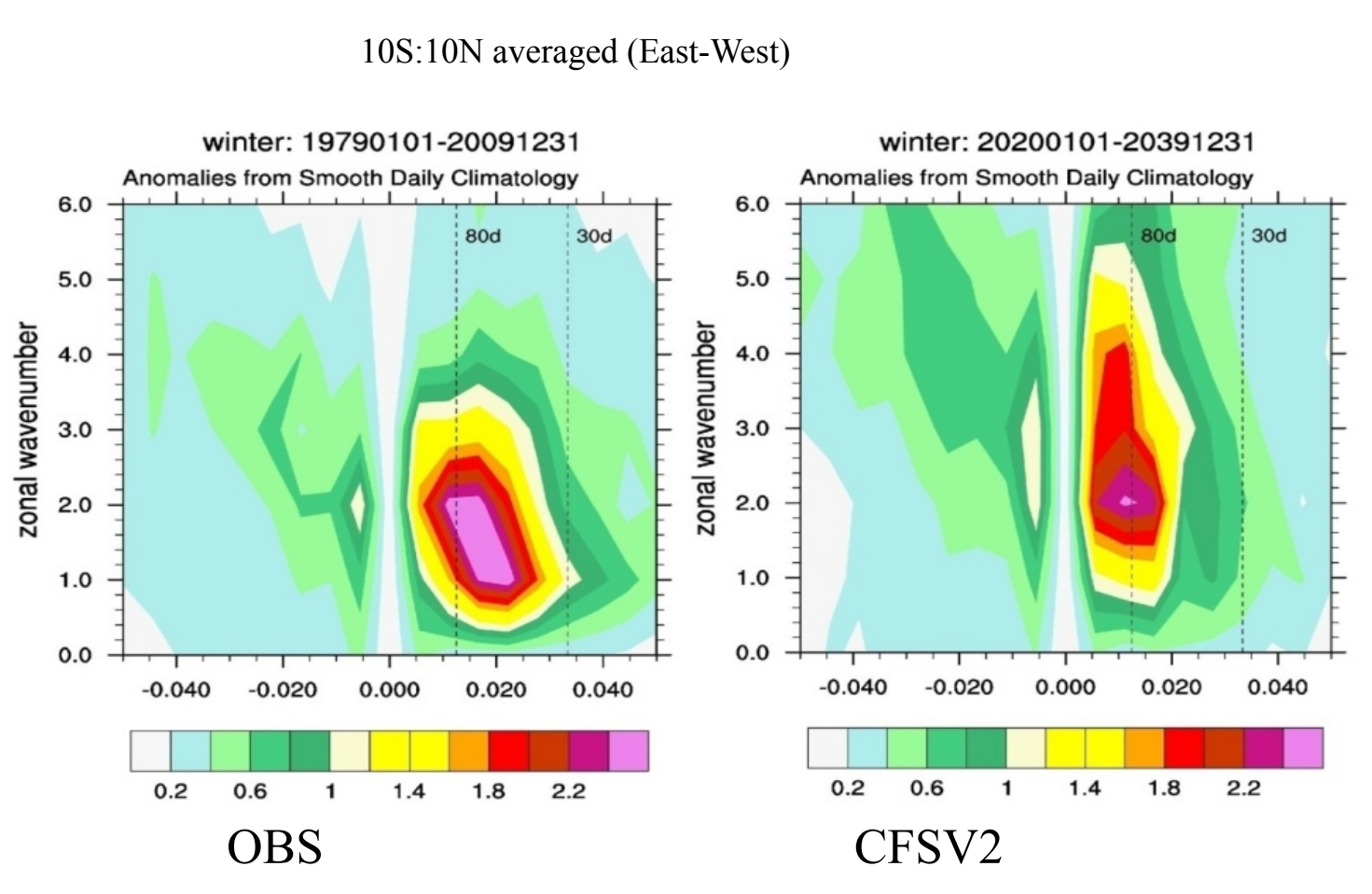
Difference in Tropospheric Temperature



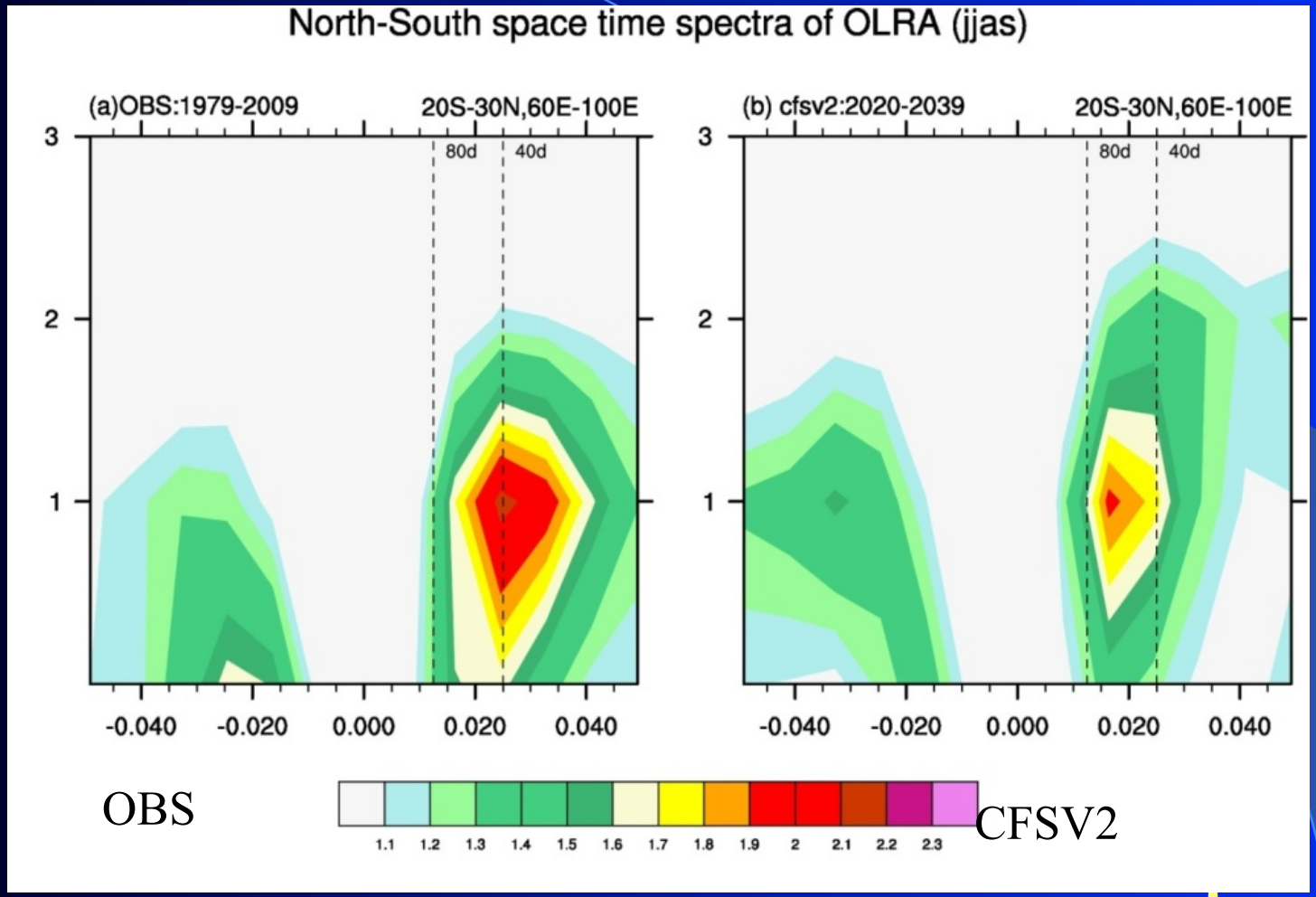
Average SWE from 200 Russian Station



East west space time spectra: OLR anomaly

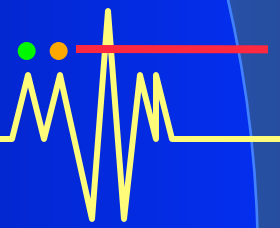


North-South space time spectra: OLR anomaly

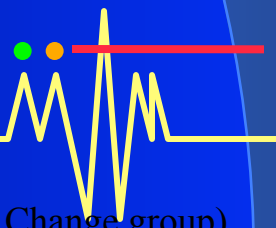


CFS development activities in India

- **Though started some time in April 2011, significant strides are made in developmental activities (Thanks to NCEP monsoon desk for interactive sessions in IITM)**
- **In near future we will be able to implement high resolution seasonal and extended range forecasts**
- **Our collaborative attempts will lead to implementing super parametrization in GFS/CFS in near future**
- **Attempts are underway to start converting CFS v2.0 to ESM by incorporating bio-geo chemistry model**
- **Bias reduction exercise is underway**

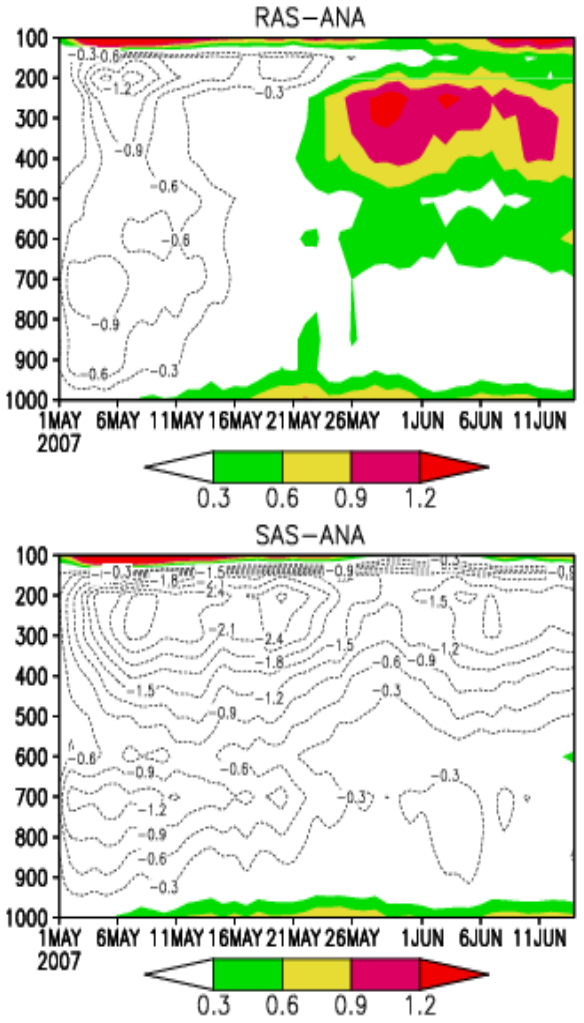


Experiments with Convective Parameterization Schemes

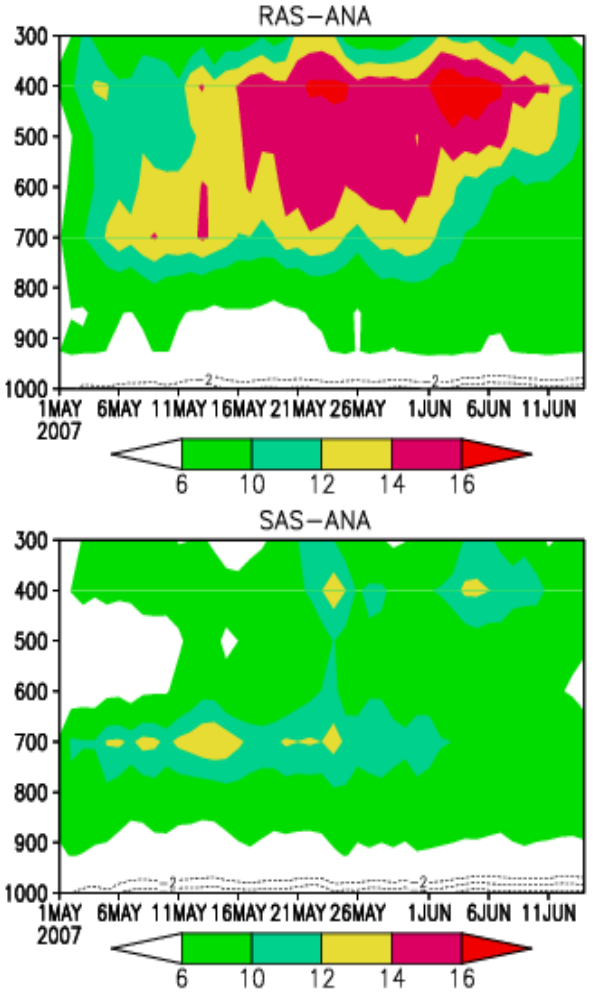


Source: Krishnan (Climate Change group)

DAY 01–45 [10S–40N,50E–110E]
TEMP(K) IC MAY 01 [2007–2001]



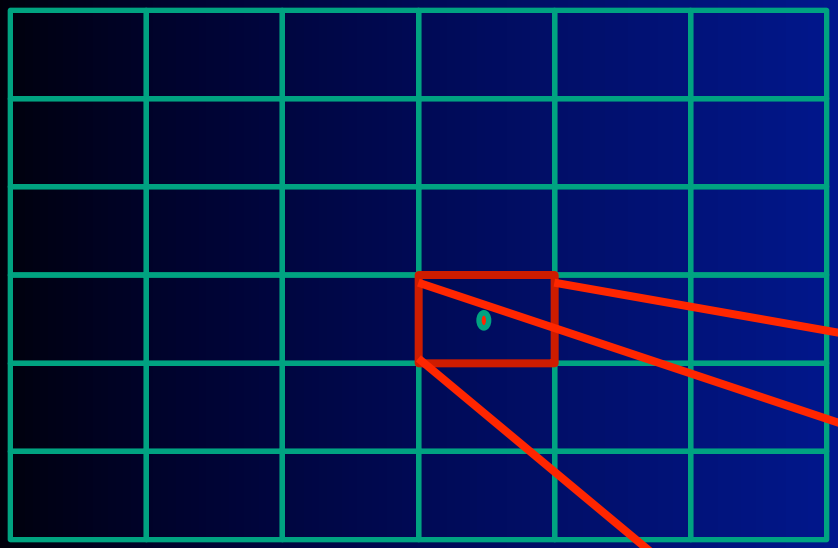
DAY 01–45 [10S–40N,50E–110E]
REL HUM(%) IC MAY 01 [2007–2001]



Superparameterization-Climate Forecast System Model (SP-CFS)

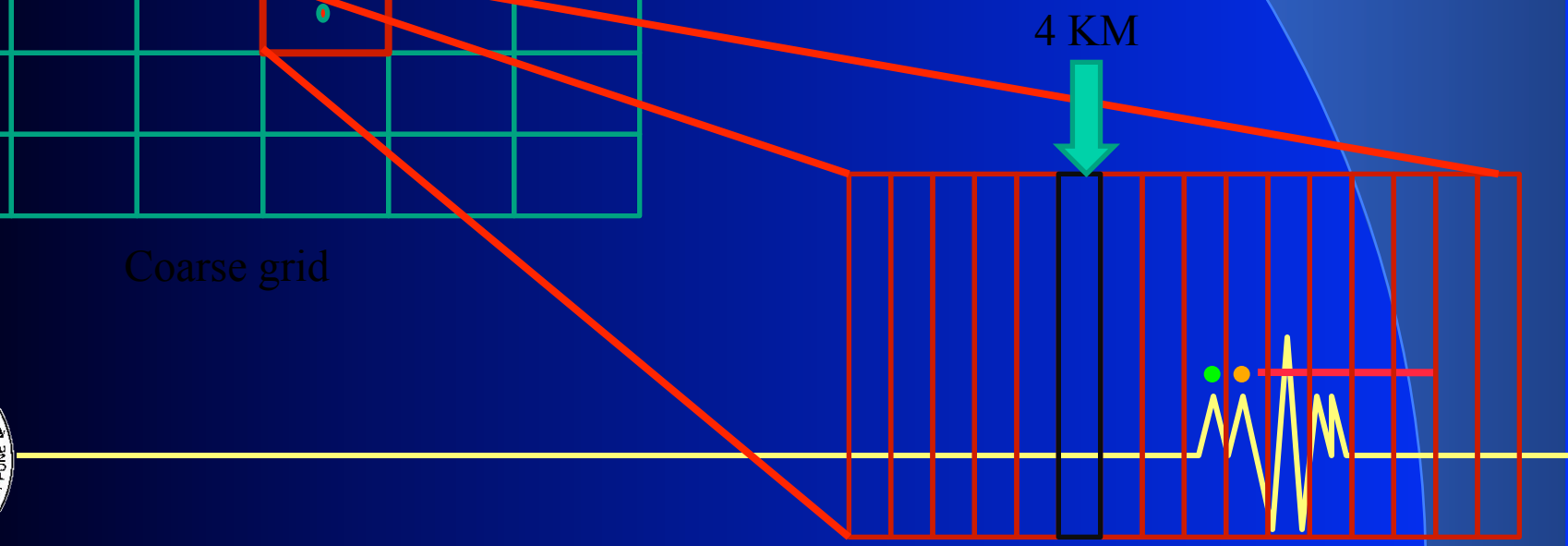
(Work being carried out by IITM Scientists in collaboration with Dr. Marat Khairoutdinov)

To include/replace the RAS/SAS (CFS model) with the Cloud Resolving Model (CRM)



Coarse grid

- Explicitly simulate deep convection
- Fractional Cloudiness
- Cloud overlap in radiative & microphysics
- Convectively generated gravity waves



Started implementing CRM in T126 CFS model

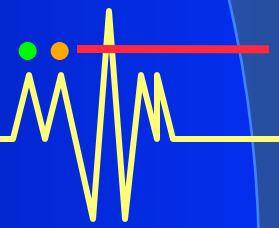
Presently in the process of creating the module (CRM Module) for the cloud-Parameterization which can be included in the CFSV2 (T126)

Phase – I

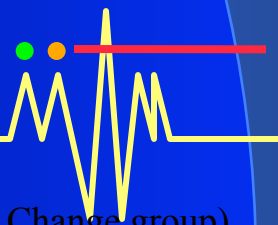
1) Planning for a 4km CRM resolution to be included in the CFS model
2) Effect of 2D –CRM to 3D – CRM (levels) in the CFSV2

Phase – II

1) Planning from 1km to 500m resolution
2) Interaction between two neighbors in a grid



Developing Earth System Model Based on CFS.v2.0: Including Ocean Bio-geo chemistry model



Source: Krishnan (Climate Change group)

INDIAN INSTITUTE OF TROPICAL METEOROLOGY

(An Autonomous Body under the Ministry of Earth Sciences, Govt. of India)

National Monsoon Mission: Call for Research Proposals

Ministry of Earth Sciences (MoES), Government of India is launching **'National Monsoon Mission'** (NMM) with a vision to develop a state-of-the-art dynamical prediction system for monsoon rainfall on different time scales. MoES has bestowed the responsibility of execution and coordination of this mission to the **Indian Institute of Tropical Meteorology (IITM), Pune**. For this national mission, IITM is collaborating with NCEP (USA), MoES organisations and various academic institutions/organizations under NMM. There is an **urgent need to develop an Indian model based on CFS coupled model with an improved hindcast skill** so that it can be transferred to the India Meteorological Department for operational forecasting. With this objective, IITM is inviting **research proposals** from Indians residing in India only.

- Call for the Research Proposals (**Last date: 30 August 2011**)
- Download the format for Research Proposal

Thanks